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Policies for Equality Under Low or No Growth: A Model Inspired by Piketty

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ABSTRACT

GDP growth is declining in industrial economies, and there is increasing evidence that growth may be environmentally unsustainable. If growth falls below returns to wealth then inequalities increase, as Thomas Piketty recently showed. This poses a challenge to managing slow and/or negative growth. Here, we examine policies that have been proposed to solve the problem of increasing income inequality in slow- or non-growing economies, including redistribution, taxation, and employment reforms. We construct a simple model, expanding Piketty's recent work, to evaluate the parameter ranges within which these different policies can be effective. Our analysis leads to two main findings. First, except in the case of complete wealth equality, any strategy to prevent increasing income inequality must reduce returns to wealth below the rate of growth. Second, several strategies may prevent an increase in income inequality during periods of low growth and may slow rising inequality, but not prevent it, in non-growing economies.

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1. Introduction

Piketty's *Capital in the Twenty-First Century* (henceforth *Capital*) documents long-run trends in wealth and income distribution across several industrialised economies, some for as long as two centuries. Piketty (2014, p. 222) uses this data to show that the share of income accruing to wealth holders has increased in recent decades to levels last seen at the end of the nineteenth century. Observing that returns to wealth (designated r) have historically been at around 3 or 4 percent in recent decades, and at around 4 or 5 percent for much of the last two millennia (2014, p. 613 n16), he theorises that income inequality between those with and those without income from wealth will increase as long as returns to wealth, r, exceed economic growth, g.

If this assessment is correct, income inequality will increase as growth slows. This is a cause for concern, as many doubt that economic growth can continue at its current rate (Gordon 2012; Summers 2013; Krugman 2014). Moreover, there is increasing evidence

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that continued growth may conflict with environmental constraints (Jackson and Webster 2016; Mardani et al. 2019). If this is correct, the adoption of environmental policies that either deliberately or incidentally reduce growth will increase income inequality, unless preventative measures are taken (Pressman and Scott 2017).

GDP growth is declining in industrial economies, and there is increasing evidence that continued growth may be environmentally unsustainable. This paper assesses different strategies to prevent rising inequality in economies with low, zero, and negative growth. We begin in Section Two by setting out how Piketty's argument has been refined and reinterpreted in response to some early critics, emphasising two broad critiques: first, that Piketty's equation $r > g$ neglects the role of the savings rate; second, that r can be disaggregated into different types of returns to wealth providing a wider range of explanations for diverging incomes in recent years. In Section Three we use these insights to develop a simple model, expanding upon the equation $r > g$ by adding a savings rate s and disaggregating r. We examine three broad strategies for preventing rising inequality in a non-growing economy. Section Four uses our model to examine a range of policy solutions proposed to prevent rising inequality, and assesses the parameter ranges within which these policies might be successful in economies with low, zero, and negative growth. The logic of the first strategy is to find exceptions to the predicted trend; that is, to see if there are any conditions under which income divergence can be avoided even though $sr > g$ holds. We show that this is possible where there is a completely equal distribution of wealth; with an unequal distribution, further measures to reduce s or r are required. The second strategy is to decrease the savings rate s, to avoid the situation in which $sr > g$. The third strategy also avoids the situation in which $sr > g$ but by decreasing the rate of return to wealth, r. Following Piketty's critics, we disaggregate r into different returns to wealth such as profits, interest, and rents and examine the implications of this strategy. Section Five examines a broad range of policies, giving us a clearer picture of the limitations of each strategy, particularly with zero or negative growth. It also suggests ways that different policies may complement each other in a policy mix, and identifies where these policies are used to some degree around the world. Section Six concludes by emphasising our two main findings– without a completely equal wealth distribution, any strategy to prevent increasing income inequality inevitably involves reducing the incomes of the wealthy, and that some strategies that might work during periods of low growth are not complete solutions for non-growing economies.

2. Piketty and his Critics

An early critique[1] of Piketty focused on $r > g$. It noted that the savings rate among the wealthy affects the rate at which inequality increases (Summers 2014; Milanovic 2014; Stiglitz 2015). If the wealthy do not save any of their income, their wealth will not increase; and if returns to wealth remain constant as wealth increases, incomes from wealth will not increase from one period to the next. The upshot is that Piketty's $r > g$ should more correctly be stated as $sr > g$ (where $0 \leq s \leq 1$), with s designating the rate of savings of the wealthy.

[1]Critics of Piketty have raised many other issues, including his focus on industrial economies and his relative neglect of wage divergence, gender, household, and other sources of inequality. Some have even questioned whether one should care whether inequality increases. Piketty and others have responded to these points (see Pressman 2015 and King 2017 for overviews of these debates).

A second criticism concerns empirical support for Piketty's explanation of the long-run divergence between the wealthy and wage earners.[2] His argument rests on the assumption that all wealth is invested as productive capital, and that returns are determined by the marginal productivity of this investment. Piketty's explanation of the approximate historical constancy[3] of *r* implies that *r* can exceed *g* because the investment of capital in technology increases capital's share from production, which in turn implies that the input of labour is being replaced by technology. This explanation assumes an elasticity of substitution of capital for labour greater than one. Indeed, Piketty's account suggests that substitutability lies between 1.3 and 1.6. However, it has been widely noted that there is a lack of empirical support for this value range (Summers 2014; Pressman 2015; King 2017), with Rognlie (2014), in particular, presenting evidence suggesting substitutability to be less than one.

More broadly, Jackson and Victor question the extent to which Piketty's findings necessarily hold. They use a simulated model closely following Piketty's assumptions, for example using a neoclassical production function to determine distribution of income (Jackson and Victor 2016, pp. 215, 208n6). Their model yields three more or less intuitive findings (see also Morgan 2017). First, inequality increases more slowly the less income the wealthy save. Second, inequality increases more slowly if *r* falls. And third, that the rate of elasticity of substitutability of capital for labour matters for the rate with which inequality increases as *g* declines.

More fundamental objections reject the neoclassical assumption that distribution is determined by marginal productivity. These critiques focus on Piketty's conflation of wealth with productive capital (Rowthorn 2014; Stiglitz 2015; Pressman 2015). Indeed, Piketty (2014, p. 18) conflates wealth and capital quite deliberately. The introductory chapter of *Capital* defines all 'income on capital' to include 'rent, dividends, interest, profits, capital gains, royalties, and other income derived from the mere fact of owning capital in the form of land, real estate, financial instruments, industrial equipment, etc.', later emphasising that he uses 'the words "capital" and "wealth" interchangeably, as if they were perfectly synonymous' (Piketty 2014, p. 47). This is required by the neoclassical theory of income distribution, where all income is divided between wealth owners and labour in accordance with how much each of these two factors contributes to production. So, the problem with conflating wealth and capital is that, since some returns represent economic rents, not all returns to wealth should be assumed to be a share of income from production.[4]

[2]As a number of authors have noted, although Piketty's theoretical explanation in *Capital* rests upon a neoclassical production function, he does at times express discomfort with a purely neoclassical account and suggest that a broader set of political and institutional factors play a role in income distribution (see Martins 2015; Pressman 2015; Morgan 2017; Naidu 2017; Piketty 2017).

[3]Determining past rates of return required significant work by Piketty and his colleagues, and assessing *r* remains a difficult task. Since different kinds of profit, rent, and interest can have very different rates, any single indicator is not necessarily a good measure of *r*. For example, the face value yield of government bonds are currently at historical lows, but these rates are set by policy, are often required purchases for large investors, and their price may still increase over time, especially given currency fluctuations. In any case, the aim of this paper is to examine economies with low or no growth; so, even if *r* falls, Piketty's equation still predicts that inequality will increase as long as $r>g$.

[4]Even in the case of productive investments, the proportion of income distributed to capital may not result solely from capital's marginal productivity, but might include some form of economic rent (Stiglitz 2015). For example, if capital uses its power to pay wages that are less than the marginal productivity of labour, those 'profits' are a form of economic rent (Jackson 2018). Solow (2014) has commented on the empirical difficulty that Piketty would have had trying to differentiate such forms of rent from profit (or wages), since it is not recorded in tax returns or balance sheets. These empirical

Jettisoning this assumption means we need no longer rely upon the empirically contested assumption of high capital-to-labour elasticity of substitution. The share of income accruing to capital can now exceed the rate at which output increases, since some of those returns to capital can be attributed to the drawing of economic rents (Rowthorn 2014; Raval 2017). But abandoning the assumption that all returns to wealth are profits from productive capital leaves us in need of an alternative explanation as to what determines the returns to wealth upon which the distribution of income depends. Pressman (2015, p. 93) suggests that this may be 'increased exploitation of workers and consumers'.

Acemoglu and Robinson (2015) use the examples of apartheid in South Africa and social democracy in Sweden to argue that politics and institutions have a large influence on distribution. Stiglitz (2015, pp. 431–432) suggests that the increasing wealth share in recent decades is largely the result of capital gains and increases in the value of rents from scarce resources such as real estate and depletable resources including oil, gas, and metals. He also contends that there has been an increase in 'exploitation rents'– the exercise of market power to create monopolies or near monopolies, the use of political influence to secure preferential contracts, and deregulation that has led to predatory financial practices such as abusive credit card practices, market manipulation and insider trading (Stiglitz 2015, pp. 432–433, 440). All such increases in wealth don't stem from increases in productivity but rather from greater transfers from the less well-off to the wealthy (Stiglitz 2015, p. 434). In short, distinguishing profits from rents, interest, and other non-productive incomes makes explicit the theoretical possibility that the distribution of income might not solely result from each factor receiving its marginal product.

Piketty does not pay as much attention to the right-hand side of his equation $r > g$. He does briefly mention a variety of possible explanations for declining growth, such as demographic and technological change, as well as noting the contribution that fossil fuels make to economic activity and that energy availability will impact future rates of economic growth. As a result, he briefly raises the possibility that growth might end altogether for 'technological or ecological reasons' (Piketty 2014, p. 93). Particularly in the context of declining economic growth, it seems possible that effective environmental policies may reduce growth rates and result in zero or negative-growth. This possibility prompts the question motivating this paper– if growth becomes very low, zero, or even negative, what policies can we use to prevent an inexorable increase in income inequality?

The next section presents a formal model that provides a framework for evaluating policies to prevent increasing inequality in a non-growing economy. It expands upon the inequality $r > g$ that Piketty contends will increase inequality. Drawing on his critics, we expand this by including the role of the savings, and distinguishing profits from other non-productive incomes. The result provides a new framework for analysing the distribution of income in low-growth and negative-growth economies. Piketty's argument in *Capital* presents just two possible strategies to prevent rising inequality: increasing taxes on the rich, and increasing g (see Naidu 2017, p. 118). By integrating the insights of his critics, the next section lets us consider a wider set of policies to mitigate inequality.

difficulties aside, the main theoretical implication here is that some portion of what appears to be profit (or wages) may actually be some form of rent.

3. The Formal Model

In our formal reconstruction, the formula $r > g$ continues to represent the key dynamic that Piketty highlights: as long as the rate of returns to wealth exceeds the rate of growth, inequality will tend to increase. Because a positive savings rate is also required, as noted in Section Two, income inequality increases as long as:

$$sr > g \tag{1}$$

Next, we disaggregate r, differentiating profits from interest, rents, and miscellaneous other returns such as from dividends and royalties:

$$r = \frac{r_k k_k + r_i k_i + r_r k_r + r_m k_m}{k_k + k_i + k_r + k_m} \tag{2}$$

Here r_k denotes profit, r_i denotes interest, r_r denotes rent, and r_m denotes miscellaneous other returns to wealth[5], denoted k_k, k_i, k_r, and k_m. Incorporating the savings rate (equation 1) and the distinction between the different returns to wealth (equation 2) into $r > g$, an expanded Piketty equation looks like this:

$$s\frac{r_k k_k + r_i k_i + r_r k_r + r_m k_m}{k_k + k_i + k_r + k_m} > g \tag{3}$$

Admittedly less concise than $r > g$, equation (3) provides a better picture of the factors behind rising inequality. We express this formally in equation (4) by introducing a λ term, with $0 \leq \lambda \leq 1$, denoting the proportion of returns to wealth that derive from productive activities. If an economy conforms to the assumption that all returns to wealth are profits, λ equals 1. If all returns from invested capital k_k are designated r_k, and all other returns are subsumed under r_i, r_r, and r_m that derive from other pots of wealth k_i, k_r, and k_m, then:

$$S\left[\frac{\lambda r_k k_k + (1-\lambda)(r_i k_i + r_r k_r + r_m k_m)}{\lambda k_k + (1-\lambda)(k_i + k_r + k_m)}\right] > g. \tag{4}$$

4. Strategies to Prevent Increasing Inequality

This section identifies three[6] broad strategies to prevent rising inequality in low-growth, zero-growth, and negative-growth economies. The analysis above suggests that income inequality will tend to increase if $sr > g$. The first strategy seeks to find exceptions to this predicted trend; that is, to see if there are conditions under which income divergence can be avoided even though $sr > g$ holds. The second strategy seeks to decrease the rate of savings, s. The third strategy seeks to decrease the returns to wealth, r.

[5]For simplicity we don't elaborate on other returns to wealth since they currently make a relatively small contribution to the income of the wealthy.

[6]For completeness, a fourth way to prevent increasing inequality would be to increase the rate of growth to equal or exceed the product of the savings rate and the rate of returns to wealth, so that $sr \leq g$. Since we are interested in solutions to the problem of rising inequality in low, zero, and negatively growing economies, we do not consider strategies to increase growth.

4.1. Redistribute Wealth to Avoid Increasing Inequality Even Though sr > g

The first strategy is to seek conditions under which income divergence can be avoided even though $sr > g$. This is theoretically possible through an equal distribution of wealth. However, if $sr > g$, wealth would need to be *completely* equally distributed in order to prevent increasing income inequality. This is because $sr > g$ represents a scenario in which the rate of return to wealth (sr) is greater than the rate of increase in total incomes (g). In such a scenario, even the slightest inequality in wealth distribution means that those who hold more wealth see their income increase faster than the income of the population as a whole. So, no matter how rapidly an economy grows, if $sr > g$ and wealth is unequally distributed, income inequality will increase: the rate of increase in incomes from wealth on the left-hand side of the equation always exceeds the rate of increase in total incomes on the right hand side.[7] This is irrespective of whether growth is fast, slow, zero, or negative.

Nevertheless, a more equal distribution of wealth will distribute the incomes from wealth more evenly and so can slow the rate at which income inequality increases. Policies to share wealth more equally may thus form an important component of any policy mix. Such policies include increased worker ownership (Booth 1995; Pressman 2015; Pressman and Scott 2017) and the creation of incentives for workers to obtain income through investing in shares (Milanovic 2016).

Unless there is complete wealth equality, policies to redistribute wealth could slow the growth of income inequality but cannot solve the problem of rising income inequality. To prevent rising income inequality when wealth is not completely evenly distributed requires reducing the income of the wealthy below the rate of growth, so that $sr < g$. This may be achieved either by decreasing s or decreasing r.

4.2. Decrease s

Rising income inequality will be stopped if s is sufficiently low. Rewriting equation (1), this occurs if $s < g/r$. For economies in which growth is slow or declining, increasing inequality can be avoided if the savings rate declines along with the rate of growth (Jackson and Victor 2016, 2018).

In the zero growth case, $g = 0$, this implies decreasing the savings rate of the wealthy to zero, so that regardless of r the rich never become any wealthier and their incomes do not increase. With negative growth, $g < 0$, we would require a negative savings rate (whilst r remains positive) to maintain $sr < 0$ and avoid greater inequality. A negative savings rate requires the wealthy to spend their wealth faster than they acquire it. Alternatively, it can be achieved through a global wealth tax, where the tax rate, t, is greater than the difference between the rate of return to wealth and the growth rate ($t > r\text{-}g$). This produces a net negative return on wealth, resulting in a reduction in both total wealth and then a reduction of income from wealth.

[7]The Appendix provides further analysis of the limits to preventing an increase in income inequality through wealth redistribution when $sr > g$.

4.3. Decrease r

Income inequality can also be prevented from increasing if the rate of returns to wealth r is sufficiently low. Rewriting equation (1), that occurs when $r < g/s$. We here distinguish three sub-strategies: directly decreasing r; indirectly decreasing r; and decreasing the elasticity of substitution between capital and labour.

4.3.1. Directly Decrease r

Jackson and Victor simulate an economy with slow and declining growth. In their model, inequality increases more slowly if r falls, as we would expect (Jackson and Victor 2016, 2018). Following from Section 4.2, rising income inequality can be prevented if $r < g$, whether growth is fast, slow, zero, or negative. Reducing r could take the form of taxation on income[8] from wealth (Piketty 2014, p. 374), as well as measures such as interest caps and rent controls (Naidu 2017).

When growth is zero, rising income inequality will be prevented if there are no returns to wealth. This $r = 0$ scenario resembles non-growing economies (suggested by Steppacher 2008; Van Griethuysen 2012; and Gerber and Gerber 2017), where positive returns to wealth are reduced to zero to avoid the impetus to grow that such returns provide. In theory, at least, abolishing all returns to wealth will remove a driver of growth and eliminate the problem of increasing inequality. Elsewhere, Lawn (2011) suggests an economy where average returns to wealth decline to zero may be possible with more modest institutional changes.

Extending the analysis to the negative growth case would require that r also becomes negative; here avoiding greater inequality requires that the wealthy, on average, receive a negative return from their wealth. When the average return is negative, profitable investments will be much harder to find. This raises the issue of the economic consequences of a negative r, as it would dramatically reduce incentives to invest.

Again, distinguishing profits from rents, interest, and other forms of income from wealth, as we have done in equation (3), brings out some other possible consequences. Piketty's data shows that returns to wealth have been fairly constant irrespective of the rate of growth, and may suggest that as post-tax profits decline, the wealthy shift their investments to activities with higher returns, such as lending at interest and residential rents. Importantly for inequality, rent and interest are often paid by those without wealth; the wealthy are more likely to own their homes, and those without wealth are more likely to be in debt (Wolff and Zacharias 2009). To counter this shift away from productive investments, we could develop policies that put caps on interest rates or we could legislate rent controls (Naidu 2017). A more comprehensive approach that taxes income from wealth might be required, such as a Georgist tax on rents, which is often proposed as a means to prevent capital flight from productive activities to unproductive investments by reducing the economic rents from land or resource use.

4.3.2. Indirectly Decrease r

Another strategy is to prevent wages from declining below a certain level. These policies are not intended to directly reduce the rate of r, but a reduction in r is implied. Following

[8]Note that in Section 4.2 the proposed wealth tax is on the stock of wealth and intended to reduce s. In this section the tax is on the flow of income from wealth, which reduces the rate of return r.

the logic of Section 4.1 and the Appendix, if the sum of the change in total incomes from wealth and from wages g declines, whilst wages stay constant, then the return to wealth sr must also decline. Such a logic underlies proposals to protect wage labour against cost-cutting by owners of capital (Jackson and Victor 2016), to establish a basic income (Jackson 2018), and to set up public employment programmes such as a Job Guarantee (Lawn 2011) or government Green Jobs Corps (Pressman and Scott 2017).

In lieu of constant wages, providing a constant level of universal public goods, which can be more effective than targeted transfers in terms of equalising income, also falls into this category (Piketty 2014, pp. 477–9; Naidu 2017, p. 117). In essence, instead of providing income to individuals to spend on public goods, the goods are provided directly. Extending the analysis to non-growing economies, when growth is zero, policies that prevent the income of the worst-off from decreasing by keeping total wages constant implies that total returns from wealth must also be zero; when growth is negative, returns to wealth must also be negative.

4.3.3. Decrease the Elasticity of Substitution Between Capital and Labour

A third, less obvious, means of decreasing r involves decreasing the elasticity of substitution of capital for labour (σ),[9] which is sometimes described as an indicator of the ease with which it is possible to substitute capital for labour as prices change (e.g. Jackson 2017, p. 177; Jackson and Victor 2016, p. 215; Jackson 2018, p. 25). Technically, σ denotes the rate with which the productivity of capital declines as it replaces labour; a lower elasticity of substitution indicates increasingly rapid declining returns to capital. Given the canonical two-input one-output neoclassical production function, $Y = f(K,L)$, where Y denotes output, K capital, and L labour, the rate at which K can substitute for L whilst maintaining Y is the marginal rate of technical substitution or $MRTS$ (such that $MRTS = (dL/dK)|Y$). This has a negative relationship to the ratio of marginal products of capital and labour:

$$-MRTS = \frac{\partial Y}{\partial L}\frac{\partial Y}{\partial K} \tag{5}$$

This tells us that the negative of the rate at which K can substitute for L whilst maintaining Y (the $MRTS$) is equal to the ratio of the marginal products of capital and labour. The elasticity of substitution is thus equal to the change in factor proportions that results from a change in the $MRTS$:

$$\sigma = \frac{\dfrac{d\left(\dfrac{K}{L}\right)}{\dfrac{K}{L}}}{\dfrac{d(MRTS)}{MRTS}} \tag{6}$$

The elasticity of substitution of capital for labour can therefore be thought of as a measure of how rapidly the marginal product of capital decreases as capital replaces

[9]Note that there are two, related, debates regarding the elasticity of capital for labour substitution. First, there is the debate about whether there is empirical support for Piketty's explanation for income divergence, which we have discussed in Section Two. Second, there is Jackson and Victor's suggestion that policies might lower the values of σ to reduce the rate at which inequality increases.

labour. Jackson uses such reasoning to suggest that a 'Cinderella economy' based upon industries with low levels of elasticity of substitutability from capital to labour may represent an economy in which inequality does not so dramatically increase as growth declines. Shifting to an economy with a lower σ could be achieved through policies to invest in sectors like education, care, and culture where substitutes for the labour of workers such as teachers, nurses, and writers are either very expensive or very difficult to find. Such sectors could be supported through investment in infrastructure, such as school and hospital buildings, community halls and theatres, museums and libraries (Jackson 2017, Ch. 8). This intuition is supported by Jackson and Victor (2016, p. 215), who find that '[h]igher levels of substitutability (σ>1) do indeed exhibit the kind of rapid increases in inequality predicted by Piketty, as growth rates decline. In an economy with a lower elasticity of substitution ($0 > \sigma > 1$), the dangers are much less acute'.

Industries with a low elasticity of substitution yield rapidly declining returns to capital. This helps clarify that there is a limit to using strategies to decrease the elasticity of substitution as a basis for solving inequality problems during zero growth and negative growth. Since decreasing the elasticity of substitution of capital for labour is a strategy that decreases r, the same consideration applies to this solution as to the other ways to decrease r discussed earlier in this section; namely, in negative growth scenarios, preventing inequality implies a negative return to wealth. Whilst it makes sense to suggest that low elasticity of substitution may slow the rate at which inequality increases during *slow but positive* growth, during *negative* growth the solution would require an elasticity of substitution that would produce a negative r: that is, it would require investment in more labour even though doing so yields a negative return. Since owners of wealth are unlikely to make investments that yield negative returns, our analysis makes plain that strategies to decrease the elasticity of substitution between capital and labour cannot, in isolation, prevent increasing inequality in non-growing economies.

As a final consideration regarding capital-labour substitution, it is important to note that while an industry may have a low elasticity of substitution, it might be highly capital intensive. In this case, labour is already receiving a small share of the income and so the rate of elasticity of substitution will make little difference to income distribution. This is one problem generated by the automation of industries that were formerly labour intensive. In the (unrealistically extreme) case of an entirely capital-intensive industry, the level of substitutability has no effect on inequality or income distribution. By extension, returns to wealth that do not derive from productive profits are not affected by the elasticity of substitution. Drawing income from interest or rent, for example, does not require hiring any labour. As a greater proportion of returns to wealth come from non-productive investments, the less difference a lower elasticity of substitution will make for income inequality.

We can express this in the terms of equation (4): as the share of returns to wealth from profit-making approaches zero ($\lambda \rightarrow 0$), the effect that elasticity of substitution has on inequality also approaches zero. Again, policies reducing income from rents and reducing interest may foster an economy where it is nevertheless attractive to invest in enterprise even though a low elasticity of substitution means that a greater share of profits go to labour (see Section 4.3.1).

5. Lessons for a Policy Mix

Our analysis provides a clearer picture of the limitations of various policies in isolation. For example, Subsection 4.1 showed that no matter the rate of growth in an economy, if $sr > g$ and wealth is unequally distributed, income inequality will increase; incomes from wealth will exceed the increase in total incomes from one period to the next. This is irrespective of whether growth is fast, slow, zero, or negative. In the absence of complete equality of wealth, some measures to decrease r or decrease s will be required to *prevent* rising inequality. Similarly, our analysis has highlighted that some policies may prevent inequality in slow or declining growth scenarios, but do not realistically generalise to the negative growth case. For example, a shift to labour-intensive industries with a low elasticity of substitutability can slow the pace of rising inequality in low-growth economies, but to prevent rising inequality during periods of negative growth would require negative returns on the hiring of labour. A shift to more labour-intensive industries, and to a more equal wealth distribution, can nevertheless play an important role alongside the other measures we have examined, although the policy mix requires that $sr < g$ (in the absence of complete wealth inequality). Indeed, although wealth redistribution and shifts to labour-intensive industry cannot be sole solutions to the problem of rising inequality, they could be the most important part of a policy mix if they slow the increase of inequality and allow additional measures to prevent inequality from increasing at all.

Our analysis further suggests that several of these measures can be mutually supportive. For example, labour-protection policies and shifts towards labour-intensive industries could indirectly reduce the returns to capital investment. As profits decline, interest rate caps and rent controls, as well as Georgist taxes on income from rents, may prevent capital flight from productive activities to unproductive investments. Publicly owned, worker-owned, and non-profit enterprises may share income more equally, and provide employment despite a lack of profits from their activities, particularly in labour-intensive services such as education and healthcare. Taxes on rents and other income from wealth could fund these sectors, whose activities ensure the wellbeing of the worst off, and might also fund transfers to the poor.

Many of these policies are already being used in economies throughout the world (see Table 1). The world's 300 largest worker cooperatives are found in 28 countries, including China, India, Brazil, and Mexico, with smaller cooperatives distributed even more widely (Jones and Kalmi 2009, p. 172); cooperatives are found to have lower rates of internal income inequality than conventional firms (Magne 2017). Preliminary research suggests that a higher presence of cooperatives correlates with some measures of lower inequality in society as a whole (Jones and Kalmi 2009). The OECD (2018) has presented the case for using wealth taxes to address inequality. Many jurisdictions have capped interest rates (Hartley and Kallis 2020), and almost every country in the world has applied rent controls within the last century (Kholodilin, Weber, and Sebastian 2018). Progressive income taxes, especially on incomes from wealth, have been highly effective in preventing wealth concentration, particularly during the mid-twentieth century when top rates were above 50 percent in France, Germany, and the UK, and reached highs of 94 percent in the US (Piketty 2014, pp. 499, 506–7). Taxes on immovable property are already in wide use, raising on average 1.1 percent of GDP in high-income countries and 0.4 percent in middle-income countries (World Bank 2019).

Table 1. List of policies to prevent increasing inequality in non-growing economies.

Broad strategy	Policy proposed	Current and past examples
1. Wealth redistribution	Promote worker ownership	Large worker cooperatives present in 28 countries, smaller cooperatives distributed even more widely (Jones and Kalmi 2009:, 172).
2. Decreasing savings rate	Tax wealth, increase spending from wealth	Levied in several OECD countries (OECD 2018).
2.1 Decreasing returns to wealth: direct measures	Interest caps and rent controls	Historically, most jurisdictions have capped interest rates (Hartley and Kallis 2020) and applied rent controls (Kholodilin, Weber, and Sebastian 2018).
	Progressive taxes on incomes from wealth	Top rates above 50 percent in France, Germany, the UK and the US during the mid-twentieth century (Piketty 2014, pp. 499, 506–507).
	Georgist land tax (taxing income from wealth)	Immovable property taxes levied across countries (World Bank 2019, p. 135); thirty countries have adopted land value taxes (Dye and England 2010, ch. 3).
	Georgist resource tax (taxing income from wealth)	Carbon taxes currently in place in more than 50 jurisdictions worldwide (World Bank 2019, p. 134).
2.2 Decreasing returns to wealth: indirect measures	Labour protection	Substantially present in high income countries (World Bank 2019, p. 118).
	Basic income	Around 100 countries have some form of unconditional cash transfers (World Bank 2019, p. 107).
	Basic services	Present across higher income democracies (Rehm 2016), and increasingly in many lower income countries (Barrientos 2013).
	Public employment	Present across high and middle income countries, and also in many low income countries (Subbarao et al. 2013, pp. 33–37).
2.3 Decreasing returns to wealth: elasticity measures	Higher investment in sectors with low substitutability of capital for labour	Investment in public services such as education and healthcare found across OECD countries (Marical et al. 2008).

Thirty countries have adopted land-value taxes (Dye and England 2010) and carbon taxes or emission trading systems are currently in place in more than 50 jurisdictions (World Bank 2020). Labour protections are also widely applied and, though the numbers have recently been falling, around a quarter of workers are unionised and collective bargaining agreements cover around one-third of workers in high income countries (World Bank 2019, p. 118). Universal basic income experiments have taken place in 19 countries (Colombino 2019), and 70 percent of 142 countries have some form of unconditional cash transfers in place (World Bank 2019, p. 107). Similarly, basic services are present to varying degrees in all high-income democracies and increasingly in lower income countries (Barrientos 2013; Rehm 2016). Public employment policies, such as public works programmes that provide temporary employment when creating or maintaining infrastructure projects, are widespread (Subbarao et al. 2013). Investment in labour-intensive public services such as education and healthcare is also widespread, and higher investment in these sectors has been found to significantly decrease inequality (Marical et al. 2008; Hidalgo-Hidalgo and Iturbe-Ormaetxe 2018).

These policies represent an expansion of existing programs rather than the establishment of completely new ones. How these existing programmes can be expanded, and the effects of such expansion, are important topics for further study. From the analysis presented here, preventing increasing inequality in a non-growing economy is possible, at least in theory.

6. Conclusions

The work of Piketty and his colleagues has brought widespread attention to the problem that inequality tends to rise if returns to wealth exceed the rate of growth. Given declining growth in industrialised economies and evidence that growth may be incompatible with environmental sustainability, this poses the challenge of finding solutions to the problem of increasing inequality when the rate of growth is low, zero, or even negative. Having briefly reviewed Piketty and his critics, we have presented a simple framework, based around the formula $sr > g$, for assessing three strategies to address this problem. One proposes redistributing wealth so that declining growth does not lead to rising inequality. A second strategy relies on decreasing rates of savings, through more spending or higher taxes on wealth. The third strategy relies on decreasing rates of returns to wealth, either as a deliberate policy goal or as an incidental result of measures that provide a minimum standard of living for the worst off.

Our framework yields two main findings. First, in the absence of complete wealth equality, any strategy to prevent greater income inequality must reduce the income of the wealthy. Second, shifting to industries with a lower elasticity of substitution from capital to labour may prevent rising inequality for low-growth economies. However, it will not prevent growing inequality for negative growth economies, since that would imply that firms would want to hire labour even if doing so yields negative returns.

Nevertheless, a wide variety of solutions can help prevent rising income inequality in a non-growing economy. Many of these policy tools are already in use in one form or another, and could be extended to prevent greater inequality in future non-growing economies. There are ways to prevent rising inequality as GDP growth declines, and even if growth is zero or negative. However, these solutions imply a reduction in income for the wealthy. To the extent that the wealthy have a disproportionate influence on political decision-making, this creates a substantial political obstacle.

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Appendix. The Limits of Redistribution When *sr* > g

Here we present an additional analysis of the limits to preventing an increase in income inequality through wealth redistribution when $sr > g$.

Assume a population of two people, A and B, where φ is the proportion of wealth W held by A, and $1-\varphi$ the proportion held by B. If the rate of savings is s and the rate of returns to wealth r and $sr > g$, then both φ and $1-\varphi$ increase at the same rate, sr, so that at the end of the first period the wealth of A has increased to $(1 + sr)\varphi W$ and the wealth of B to $(1 + sr)(1-\varphi)W$. So as long as $\varphi \neq 1-\varphi$, the wealth of the wealthier person will increase by more than that of the less wealthy person, in absolute terms; subsequent periods will therefore also see an absolute increase in their incomes from wealth. Wealth inequality will increase faster the greater the initial wealth disparity, if the wealthy have a higher savings rate, and if the wealthier receive a higher rate of return. So, when $sr > g$, any deviation from perfect wealth equality will result in increases in inequality of wealth and of incomes from wealth.

So unless there is perfect wealth equality, the question of preventing an increase in income inequality becomes an inquiry into whether the divergence in income from wealth can be matched by increasing income from wages for those with less wealth. But wages cannot be increased to match the higher income from wealth when $sr > g$. This is because, in the absence of perfect wealth equality and when $sr > g$, the rate at which the income of the wealthy increases is higher than the rate at which total incomes increase.

Unless wealth is completely equally distributed, if $sr > g$ then policies of wealth redistribution can at best slow the increase in income inequality but cannot prevent inequality increasing altogether. So though a more equal distribution of wealth could substantially slow the increase of income inequality, in the absence of a totally equal distribution of wealth some measures to decrease s or to decrease r will be required to actually prevent income inequality from increasing.

Another way to show this is to let R represent total incomes from wealth such that $R = rk$ where, as in equation (3), r designates the rate of return from all the various different incomes deriving from the total sum of wealth k (and assume $k > 0$: there is some wealth in the economy). Assuming all income is either from wealth or from wages, and designating R_1 as the total income from wealth and W_1 as the total income from wages for the first period, and R_2 and W_2 as the respective totals for the second period, the rate of growth (still designated g) from period one to period two is defined as:

$$g = \frac{R_2 + W_2 - R_1 - W_1}{R_1 + W_1} \tag{A1}$$

Since $sr > g$, equation (A1) implies that, in the absence of complete wealth equality, returns to wealth exceed the total increase in income from one period to the next. Substituting equation (A1) into $sr > g$:

$$sr > \frac{R_2 + W_2 - R_1 - W_1}{R_1 + W_1} \tag{A2}$$

equation (A2) shows that no matter how rapidly an economy grows, if $sr > g$ and wealth is unequally distributed, income inequality will increase: the rate of increase in incomes from wealth on the left-hand side of the equation always exceeds the rate of increase in total incomes on the right hand side. This is irrespective of whether growth is fast, slow, zero, or negative. In other words, in economies where wealth is not completely evenly distributed, preventing increasing inequality will inevitably involve reducing the incomes of the wealthy by either decreasing s or decreasing r.

The relationship is perhaps easiest to see in the zero-growth case, that is, where $g = 0$, so that equation (A1) can be rewritten:

$$R_2 + W_2 = R_1 + W_1 \tag{A3}$$

This shows that in a zero-growth economy, if total income from wealth increases from period one to period two, then total wages must decrease by the same amount. This formally states a condition that is true of any strategy attempting to prevent increasing income inequality in non-growing economies: when growth is zero, any increase in one person's income must be accompanied by a decrease in another person's income. Similarly, in a negatively growing economy, even just maintaining one person's level of income implies a decrease in somebody else's income over the same period. In other words, when there is zero growth, the change in total incomes from wealth and from wages is zero sum; when there is negative growth, the change in total incomes from wealth and wages is negative sum.